INTENSITY OF STORM/FLOOD EVENTS

Based on Tide Data

Date	Event	Inches of Rainfall	Highest Tide (ft)	Highest Plant Flow
Feb 1978	Blizzard '78	Snow	18.42	?
Aug 1989	Rain Storm	5.07	13.59 (No Affect)	7 MGD
Oct 1991	No-Name Storm	3.61	17.69	10 MGD
Dec 1992	Rain & Flood	5.54	17.52	>12.5 MGD

~70yr Storm

~25yr Storm

~20yr Storm

No Backup Pumping @ These Flows!

NOAA Data

NOAA

Couldn't measure peak flow

V = Tide Floods ≠ Increased Plant Flow

>12.5 exceeds year 2023 Ultimate year Peak Daily Flow.

Original Design called for upsizing Inf. & Eff. Pumps!

3056

Appendix D

Hull WPCF Design Data

DESIGN DATA

WATER POLLUTION CONTROL FACILITY

HULL, MASSACHUSETTS

Current Avg. Flow ~ 1.7 MGD

I. GENERAL

Design Period	25 years (1998)
Degree of Treatment	Secondary
Type of Treatment	Conventional Activated Sludge

II. GENERAL DESIGN DATA

	Initial	Design (1998)	Ultimate (2023)
Total Population	10,000	31,000	37,800
Sewered Population	4,500	26,100	37,800
Average Flow, mgd			
Domestic, mgd	0.45	2.61	3.78
Commercial, mgd	0.06	0.07	0.07
Transient, mgd	0.25	0.25	0.25
Infiltration, mgd*	0.14	0.14	0.14
Total ADF, mgd	0.90	3.07 - DESIGN	4.24
Peak Daily Flow, mgd	2.80	7.80	PEAK - 10.00 to 12.5 MGD
Average Septage Wastes	.02	0	0
Peak Septage Wastes	.03	0	0
Organic Loadings			
Dom., Com., & Trans., lbs./day	1520	5850	8200
Septage Wastes, lbs./day	420	-	-
Total, lbs/day	1940	5850	8200
Suspended Solids			
Dom., Com., & Trans., lbs/day	1580	6120	8480
Septage Wastes, lbs/day	500	-	-
Total, lbs/day	2080	6120	8480

*Indicates infiltration in existing sewers after rehabilitation. Infiltration for proposed sewers included in per capita allowance as indicated in Domestic Flow figures.

	1998	2023
III. PRETREATMENT FACILITIES		
Coarse Bar Rack		
Number	1	1
Type	Manual	Manual
Bar Spacing, inches	2-1/2	2-1/2
Grit Removal		
Number Tanks	1	1
Type	Aerated	Aerated
Dimensions, feet	16.5x16.0x12.5 SWD	16.5x16.0x12.5 SWD
Air Requirements, cfm/feet length	4.0-6.6	4.0-6.6
Grit Screw Conveyor, Hp	1/2	1/2
Blower, cfm	40 to 73	40 to 73
Motor, Hp	5	5
Fine Bar Rack (Bypass)		
Number	1	1
Type	Manual	Manual
Bar Spacing, inches	1-1/2	1-1/2
Comminutors		
Number	1	1
Capacity PDF (mgd)	11.0	11.0
*Septic Sewage Holding Tank		
Number Tanks	2	2
Total Capacity, each, gal.	30,000	30,000
*Septic Sewage Receiving Tank Capacity	3,300	3,300
IV. PRIMARY CLARIFIERS		
Number of Tanks	2	2
Tank Diameter, feet	55	55

*Septic sewage holding tank equipped with air diffusion.
Septic sewage receiving tank equipped for chlorination.

	1998	2023
Side Water Depth, feet	10	10
Surface Area, feet^2 (Total)	4750	4750
Overflow Rate, gpd/ft^2 (ADF)	645	900
Detention Time, hours	2.8	2.0
Weir Loading Rate, gpd/lf (ADF)	8900	12300
Overflow Rate gpd/sf (PDF)	1650	2100

V. AERATION TANKS

Number of Tanks	4	6
Organic Loading #BOD/day	4095	5740
Tank Dimensions (each), feet	50x50x12 SWD	50x50x12 SWD
Volumetric Organic Loading, #BOD/1000 cf	34	32
Mean Biomass Loading, #BOD/lb MLSS	.35	.35
Detention Time, hours	6.9	7.7
Power Required (1.0 lb. O_2/lb BOD applied @ 3.0 lbs O_2/Hp/hr) Hp	14.2	20.0
Power Required (for mixing @ .75 Hp/1000 ft^3), Hp	22.5	22.5
Aerator Size, Hp	25	25

VI. SECONDARY CLARIFIERS

Number of Tanks	2	3
Tank Diameter, feet	60	60
Tank Side Water Depth, feet	12	12
Surface Area (total), sf	5652	8478
*Overflow Rate @ ADF, gpd/sf	540	500
*Overflow Rate @ PDF, gpd/sf	1380	1180
*Detention Time @ ADF, hours	4.0	4.3

VII. POST CHLORINATION

Number of Tanks	1	1 + outfall **
Gross dimensions	53x31x10' SWD	53x31x10' SWD
Net Volume (gallons)	88,500	147,300
Detention Time @ PDF, min	16	23.0

*Based on Design Flow.

**Based on utilization of 2500 feet of 24-inch outfall.

? Gallons ?

Volume = πr^2 x depth x 7.48 $\frac{Gal}{ft^3}$

$30^2 \times 3.14 \times 12 \times 7.48$

253,661 gallons.

= .253 Million Gallons.

	1998	2023
VIII. CHLORINATORS		
Number of Machines	3	3
Estimated Maximum Chlorine required lbs/day	976	1250
Machine Size lbs/day	2 @ 500, 1 @ 50	3 @ 500
Chlorine Cylinder Size, tons	1	1
IX. EMERGENCY POWER		
Generator Size, kw	500	500
X. SLUDGE HANDLING		
Sludge Production		
Primary Sludge @ 1% Solids, lbs/day	3650	5090
Waste Activated Sludge @ 0.5% Solids, lbs/day	3820	5270
Total Sludge Production, lbs/day	7470	10,360
Primary - Waste Activated Sludge Blending Tank		
Number of Tanks	1	1
Capacity, gallons	1500	1500
Dimensions, feet	5x5x8 SWD	5x5x8 SWD
Detention, min.	5.1	6.0
Gravity Thickeners		
Sludge Loading, lbs/day	7470	10,360
Number of Tanks	2	2
Diameter, feet	30	30
Side Water Depth	12	12
Solids Loading Rate, lbs/ft^2	5.3	7.3
Combined Sludge Holding Tank		
Solids Loading, lbs/day	7095	9850
Number of Tanks	2	2
Volume, ft^3	10,600	10,600
Tank Dimension (each) ft	27x27x14.5	27x27x14.5
Detention Time, days	7.4	5.3
Vacuum Filters		
Solids Loading, lbs/wk	49,700	68,000
Number of Units	2	2
Size (each) feet	2-8ø x 6 (150ft^2)	2-8ø x 6 (150 ft^2)
Solids Loading Rate, lbs/sf	4.2	4.2

	1998	2023
Hrs/wk Operation	40	55
Filter Cake Prod. #/hr	1263	1273
Expected Solid Content, %	20	20
Sludge Incineration		
Total Dry Solids Loading (Sludge, Grit, Gease & Scum), lbs/wk	63,770	88,390
Total Wet Solids, lbs/wk	277,200	384,200
Wet Sludge Loading lbs/hr/sf	7.1	7.2
Ash cy/wk	22	30
Incineration Size, dia.	16'-9" dia. x 7 hearth	16'-9" dia. x 7 hearth
Hrs/wk Operation	40	55

X. MAJOR PUMPS

Influent Pumps		
Type	Cent. Variable Speed	Cent. Variable Speed
Number	4	3
Capacity (each), gpm	2 @ 800, 2 @ 4,000	3500 ≡ 15.1MGD
Approx. Hp	2 @ 20, 2 @ 50	75
Effluent Pumps		
Type	Propeller - Var. Speed	Propeller - Var. Spee
Number	3	3
Capacity (each), gpm	2700	3500 ≡ 15.1MGD
Approx. Hp	50	50
Recirculation Pumps		
Type	Variable Speed	Variable Speed
Number	3	3
Capacity, gpm	800	1100
Approx. Hp	25	30

Metcalf & Eddy Services

Metcalf & Eddy Services, Inc.
P.O. Box 554
Hull, Massachusetts 02045
(617) 925-0906

TO: Eric Teittinen

FROM: Ray Cranmer RC

DATE: November 7, 1991

SUBJECT: Emergency Incident at the Hull WWTF from 10/31/91 thru 11/4/91

Heavy rains, wind and extereme high tides on Wed 10/30/91 and Thrusday 10/31/91 caused the Treatment Plant to be inundated with salt water, sand, rocks and other debris. If not for the knowledge and dedication of John Caron and Dan Baransky the initial surge of water would have flooded the Facility. The on-site personnel (John Caron, Dan Baransky and Rich Basler) operated the pumps and hydraulic gates manually to prevent flooding the Influent and Effluent Pump room. John made a decision to send Dana Reeve and John Luniewicz home so that they could return when the tide subsided and provide much needed relief. On Thursday morning Frank Cavaleri, Pete Bernard and myself arrived at the Facility and provided much needed assistance. I can never express in words the dedication and knowledge of Frank in organizing a "Disaster Team", equipment, rentals, repairs and general supervision. I personally can never thank him enough. He is truly and "M & E Team Player".

The assistance provided by Aram Varjabedian with equipment and personnel only proves that when your in "Trouble", M & E works as a great team. Another example is John Gross who arrived here on Tuesday 11/5/91 to supervise a "Confined Space Entry" to repair a Hydraulic Gate that I believe has not worked since 1978. John not only supervised the project but also worked along side plant personnel in the Wet Well and completed the repairs to the gate within one (1) hour.

There are many people who responded and assisted without question. The list is long but I feel they all need to be recognized. Included along with yourself are:

Frank Cavaleri
John Gross
Mike Sause'
John Caron
Dan Baransky
Dana Reeve
Rich Basler
John Luniewicz
Peter Bernard
Aram Varjabedian
Gary Correia
Gary Murrill
Greg Choukas
Ed Roach
Pete Nyberg
Dave Doyon
Mark Janson

Metcalf & Eddy
M&E Services

DRAFT - ERIC - FOR YOUR REVIEW & COMMENT FOC

MEMORANDUM

FILE: 321 DATE: September 5, 1989

TO: Wiff Peterson OFFICE: Danvers

FROM: Frank Cavaleri COMPANY: M&E Services

SUBJECT: HULL EMERGENCY - HULL PERSONNEL/DANVERS PERSONNEL

A series of severe events occurred at the Hull WWTP from August 11th to August 18th, 1989. The combination of these events constituted several "emergency" situations at the Hull Plant (see attached report to DEQE). Only the swift and proper response of the Hull Staff, and the assistance of the following, Norm Rogers and the Town of Hull DPW workers, Norm Lamy and Mark Janson, (Con Ops Support Maintenance Specialists), Universal Electric, (Electrical Contractor) and several other people and vendors, averted a more serious emergency. As you know, the Hull Plant has the potential of totally flooding during a major storm - and it almost did during these recent events.

The most important actions which kept the plant from totally flooding (the effluent pump room did flood to approximately 5 feet deep) was done by Dana Reeve, Maintenance Chief. Dana's quick action of shutting the influent gate and the aeration tank effluent gate and the aeration tank effluent valves, kept the effluent pump room from flooding out worse than it did. Ed Roach, Pete Wallace and Dave Dedian were also in the plant at this time, and assisted with emergency procedures.

The events that occurred over the August 11th to August 18th are too substantial to detail here. But, the seriousness of the event; the importance of the proper actions taken by the staff; the necessity (and the accomplishment) of staffing the plant for 24 hours with two people (plant staff and Con Ops Support personnel); John Caron, Assistant Plant Manager, returning early from vacation; the massive clean up when the "emergency" was under control; the assistance from Aram Varjabedian (Rockland) and Dave Doyon and Derek Baker (Fall River); and other people both within and outside M&E Services; and for all the other details that I am neglecting to mention here; all these things combined require (or I recommend) that M&E Services "corporate" recognize the dedication and hard work performed by all these people. Ed Roach did an excellent job of coordinating and managing this crisis.

We have put a substantial "commitment" into Hull, and the client and the Town are very pleased with us. Our actions during this event strengthen this commitment, and we need to reward those who deserve it, and use these events to further our goal to have a successful project.

P.S. Eric - A). I would like to discuss this memo with you, Jack & Wiff - It does not say everything we need to about the events at Hull.

B). We need to review costs involved also.

_____

Frank Cavaleri

FC/wjf

Rain date